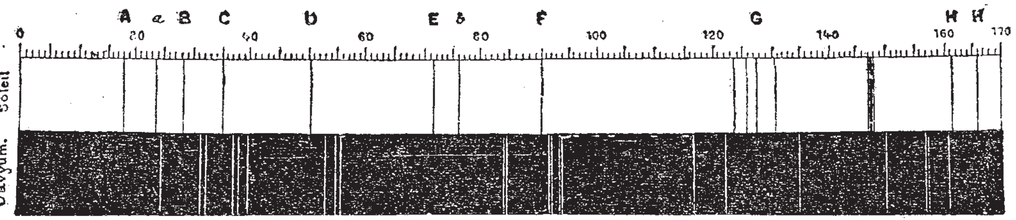
was treated, for the separation of the metal, by the analytical method of Prof. Bunsen. The mother-liquor obtained after the separation of the rhodium and iridium was heated with an excess of chloride of ammonium and nitrate of ammonium. A dark red precipitate was obtained after calcination at red heat. It yielded a greyish mass resembling spongy platinum. The ingot resulting from 600 grammes of mineral weighed 0·27 kil.

The metal was dissolved in aqua regia, in order to examine the action of different reagents on the solution. Potash gave a clear yellow precipitate of the hydrate of davyum, which is easily attacked by acids, even by acetic acid. The hydrate of davyum dissolved in nitric acid gave a brownish mass of nitrate of davyum; by calcining this salt a black product is obtained, which is probably the monoxide.

The chloride of davyum, dissolved in a solution of potassic cyanide, gave, by gently evaporating the solution, beautiful crystals of a double cyanide of davyum and potassium. In this salt the potassium may be replaced by several metallic elements. The cyanodavic acid is very unstable; it is isolated by passing a current of sulphuretted hydrogen through a solution of the double cyanide of lead and davyum. Sulphuretted hydrogen produces, in the acid solutions of davyum, a precipitate of sulphide of davyum, which is easily attacked by the alkaline sulphides, yielding probably a series of sulpho salts.

A concentrated solution of chloride of davyum yields, with potassic sulpho-cyanide, a red precipitate, and when gently cooled, produces large red crystals. If the same precipitate is calcined the sulpho-cyanide of davyum takes the form of a black powder. These reactions show that this salt is allotropic.



Spectrum of davyum according to the data of Sergius Kern.

The chloride of davyum is very soluble in water, alcohol, or ether; the crystals of this salt are not deliquescent. The calcined salt gives the monoxide as a residue. Chloride of davyum forms double salts with the chlorides of potassium and ammonium. They are insoluble in water and very soluble in absolute alcohol. The double salt of sodium and davyum is almost insoluble in water and alcohol; this reaction is very characteristic, because many sodic salts of the platinum group are very soluble in water.

This chloride of davyum is the only one which exists, as the second product, containing more chlorine, is decomposed during the evaporation of the solution, disengaging chlorine.

I have made some new researches on the density of melted davyum; three experiments gave the following numbers :—9,383 9,387, 9,392 at 24°. These results agree very sensibly with those of my first researches; the density of davyum given in my first note to the Academy being 9.385 at 25°.

M. Alexejeff has undertaken the determination of the equivalent of davyum; but as the quantity of davyum which I possess is very small, exact researches are difficult. Preliminary experiments have shown that the equivalent is greater than 100, and probably about 150–154.

Some new platiniferous sands, which are to be placed at our disposal, will yield a sufficient quantity of the new metal for additional experiments. We hope to have in time nearly 1·2 gr. of davyum.

Finally I have investigated the spectrum of davyum by vaporising the metal in powder between the carbons of the electric lamp. The spectroscope at my disposal is not powerful enough to show precisely all the secondary lines. This is why I have only indicated the principal lines easily visible in my spectroscope.[1]

THE GREAT DETONATING METEOR OF NOVEMBER 23, 1877

HAVING fully discussed the whole of the accounts of the great meteor that have reached me, consisting of some ninety direct communications and forty or fifty newspaper cuttings, I have the pleasure to forward to NATURE a condensed description of it.

The points of most importance to be determined are—1. The true orbit which is obtained from a knowledge of the radiant and velocity of motion. 2. The height at which it first became luminous, as our knowledge of the real extent of the earth's atmosphere depends exclusively upon such determinations. 3. The height at which it exploded and came to an end. That this last is connected with the physical condition and constitution of the body cannot be doubted. The brightness of meteors seems always to depend upon the distance they penetrate into the air. Generally, when they get below 30 or 40 miles, they are very remarkable.

The Greenwich mean time was 8h. 24m. 30s. on November 23.

There are but few descriptions of the path of the great meteor in question from which to derive the radiant point. Five of the fully-described tracks meet almost exactly in R.A. 62°, N.P.D. 69°. The others tend to support this position rather than to alter it, but many are, as is usual, extremely wild, passing 20°, and even 30° from it. To an observer situated near the middle of the north coast of Wales, this radiant would bear south 74° E., at altitude 37°.

The meteor first came visible to Mr. T. B. Barkas, at Newcastle-on-Tyne, to another observer at Tynemouth, to the Rev. G. Iliff, at Sunderland, and Mr. E. Pikard, at York, at the great height of 96 statute miles. The observers agree very closely. It is probable, of course, that had any one been actually looking in the right direction, it might have been seen a little earlier when it was still higher. A height exceeding 90 miles is certain. The meteor was then vertically over a point 13 miles north of Derby, and its appearance was that of an ordinary shooting star. Descending in the air at the inclination of 39° to the surface of the earth, when 48 miles exactly over Liverpool, it became intensely brilliant, so suddenly, that many observers speak of this as the first explosion.

It was at this instant that it attracted universal attention. People as far distant as Essex, Roscommon, Edinburgh, Bristol, and Queenstown, 200 miles from it,

[1] *Comptes Rendus* and *Chemical News*.

describe it as being nearly as large as the full moon and greatly exceeding it in brilliancy. An observer at Ashby-de-la-Zouch first noticed his shadow, and those of neighbouring trees thrown *towards* the moon, then shining brilliantly in the east. Persons much nearer the scene, sitting in rooms with the blinds down, were frightened by the flood of light that suddenly found its way in. The meteor exploded with great violence at the height of 14 miles over the Irish Sea, 20 miles N.N.W. (true) of Llandudno. The total length of path was 135 miles, which was traversed in about 8 seconds of time, or with a velocity of $17\frac{1}{2}$ miles per second, as determined from twenty-three estimations of its duration.

The streak left in the air extended for 40 miles along the track, and was not less than 2,000 feet in diameter.

The violence of the explosion was such, that at Bangor, Beaumaris, Conway, and Llandudno, doors and windows rattled, and people ran out to see what was the matter. As far as Chester the sound resembled "thunder not very far distant," or "a salvo of artillery."

It is a fact worthy of thoughtful consideration that the body which was capable of producing this convulsion, probably exceeding the discharge of the 81-ton gun in the proportion of a hundred to one, was converted into impalpable powder in eight seconds of time, merely by the rapidity of its transmission through very attenuated air. After the explosion nothing remained but dully incandescent dust or ashes, which slowly fell a short distance *vertically* downwards. That is to say, there was not one remnant sufficiently heavy to continue in the same direction, or to retain the original velocity, because such a remnant would have been visible itself as a bright meteor. A momentum which, estimated in foot-tons, would reach some enormous figure, was instantaneously reduced to nothing, or, rather, converted into atmospheric waves—and dust!

The exact position and height of the explosion is fixed by the singular observation of Mr. Petty, at Llandudno (NATURE, vol. xvii. p. 183), who did not even see the meteor itself, but its light on the hearthrug coming through a chink in the blind.

Mr. J. Ismay, the superintendent of telegraphs at Liverpool, who observed the explosion from the beach at Llandudno, measured the sound-interval, and found it between 2 min. and 2 min. 15 secs. From the spot where I have assumed the explosion took place to his position is 25 miles, which sound would traverse in two minutes exactly.

The orbit deduced from the apparent position of the radiant point is—

$$i = 0$$
$$\pi = 153^\circ$$
$$q = \cdot 47$$

Motion direct.

The relative velocity obtained by assuming a parabolic orbit is 19 miles per second, agreeing very closely with that found by observation.

If the longitude of the radiant be diminished 3° or 4°, the orbit is so far modified as to almost coincide with that of the comet of 1702. The comet was not very well observed. The meteor belonged to the well-known shower of *Taurids*, first discovered by Mr. R. P. Greg, encountered by the earth with great regularity about November 21–23. In 1877 it appears to have been very prolific of bright and of detonating meteors.

G. L. TUPMAN

OUR ASTRONOMICAL COLUMN

THE COMETS OF 1618.—The year 1618 presented a phenomenon which is perhaps unique in the history of the appearances of comets, two of these bodies having been conspicuously visible at the same time in certain parts of he earth, and for several days, at least, in the same quarter of the heavens, with trains of thirty or forty degrees in length, and upwards. Cometographers previous to Pingré had been much exercised with reference to the comets of this year; Comiers, in "La Nature et Prestige des Comètes," had supposed that six comets in all were observed in 1618; this number was reduced by Pingré to three, which appears to have been beyond doubt the correct number, though another cometographer, Struyck, disputed the distinctness of Pingré's second.

The first comet was discovered at Caschau, in Hungary, on August 25, and two days later by Kepler, at Lintz, where it rose in the morning about three o'clock, with a tail directed towards the west. Kepler observed it on several occasions, and for the last time on the morning of September 25, and from his rough indications of its positions Pingré calculated the elements which figure in our catalogues, and which it will be found represent the track of the comet pretty nearly; there can be no confusion between this object and the second or third comets of the year.

The third comet, as Pingré remarks, "eut autant d'observateurs qu'il y avoit alors d'astronomes en Europe." It was first seen in Europe in the last days of November, and was observed by Cysat at Ingoldstat till January 21, he having used optical aid, though other observers lost it at the beginning of the month, or even earlier. The elements, first calculated by Halley, were more accurately investigated by Bessel, whose orbit, published in 1805, agrees with the observations as closely as the errors, with which they are obviously affected, will allow. There is no difficulty, therefore, in fixing upon the position of the third comet, with sufficient approximation in the month of November previous to its discovery in Europe.

It appears to have been one of the finest comets of the seventeenth century, apparently hardly exceeded in the imposing character of its appearance by the celebrated comet of 1680. The tail gradually increased in length until, on the morning of December 10, the Danish astronomer, Longomontanus, estimated its extent at 104°, with marked coruscations.

The second comet of 1618, according to Pingré, to which these remarks are intended more particularly to refer, was discovered in Silesia, and also at Rome, on the morning of November 11, as Kepler tells us (*De Cometis lib. I.*). The nucleus was lost in the twilight, but the tail was visible from 4h. 20m. to 6h. 40m. at Rome. On the following mornings the tail was seen at other places in Europe, and by Kepler himself at Lintz, at 5h. 30m. A.M. on November 20; he then describes it as a train of milky-white light, passing below the stars in the quadrilateral of Corvus, and reaching the extremity of Crater. He saw this train for the last time on the morning of November 29, when "inter atras nubes et ventos vehementes, cum campi essent picti nivula, apparuit tamen tractus iste secundi cometæ, sed valde dilutus nec æquans albedinem nubium a luna illuminatarum." This was at 5 A.M., and an hour and a half later, the clouds having somewhat dispersed, he obtained his first view of the third comet, which was then in longitude 221°, with between 9° and 10° north latitude. Thus we see that Kepler saw both comets on the same morning, though he failed to detect the nucleus of the second in the strong twilight; and it may be added that Blancanus, at Parma, had similar experience.

In more southern latitudes the second comet was pretty favourably situated for observation, and its nucleus was observed. Figueroes, ambassador of Spain, at Ispahan, and the Jesuits at Goa, saw both comets simultaneously, and determined positions of the nucleus of the second. Riccioli mentions that Father Kirwitzer, an Austrian, was sent out to China, and died at Macao in 1626, adding that he wrote of observations made in India on the comets of 1618.